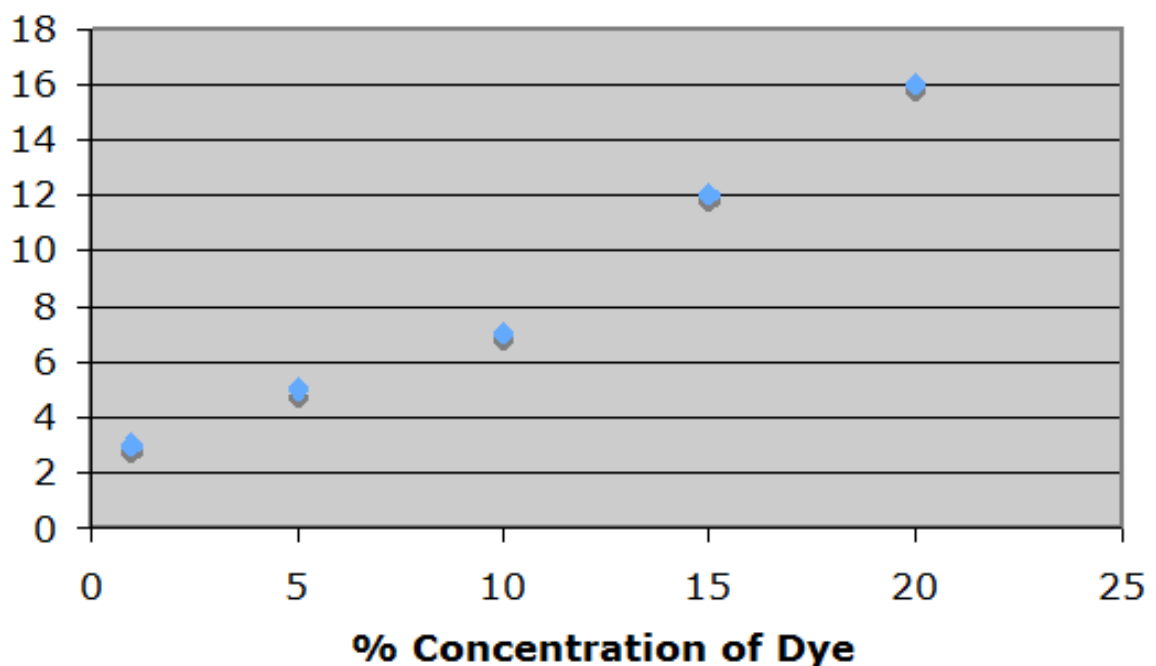


Question Paper on Cells

Student directions

Students in a grade 10 biology class examined the effect of concentration on rate of diffusion by placing agar 2cm x 2cm cubes in solutions of dye at concentrations of 1%, 5%, 10%, 15% and 20%. The cubes were immersed in the solution for a period of 20 minutes. At the end of the experiment the cubes were removed, patted dry and sliced in half. The distance the dye traveled from the edge of the cube to the center of the cube was measured to the nearest millimeter using a clear plastic ruler (+/-0.5 mm). Their results are displayed below.

Figure 1: Average Distance travelled (mm) by dye in 2cm x 2cm cube after 20 minutes in solution of dye at 1%, 5%, 10%, 15% or 20% concentration



1. **State** the independent and dependent variables in the experiment.

a) independent:

b) dependent:

2. **Analyze** the relationship between the concentration of dye and the average distance traveled in the cubes.

3. **Deduce** the average distance the dye traveled when the dye concentration was 10%.

4. **Suggest** two controlled variables for this experiment other than length of time in the solution.

5. **Comment** on the importance of these data to understand how materials move into and out of

Question Paper on Cells

cells.

Part B: Extended Response

Choose one of the following questions and answer all parts of the question. In addition to the points awarded for each section of the question there are an additional two points available for the clarity and organization of your answer.

1. Compare prokaryotic and eukaryotic cells. (4 marks) Outline how a specific named substance enters or exits the cell. (4 marks)
2. State the names of two organelles found in eukaryotic cells and describe their importance to the cell. (4 marks) Outline how cells divide. (4 marks)
3. State the names of the two organelles involved in energy transformations in eukaryotic cells. (2 marks) Outline the raw materials (substrates) for each of these organelles and their products. (4 marks) Draw a diagram of one of these two organelles. (2 marks).

Support material

Markschemes/markings notes:

1. State the independent and dependent variables in the experiment.
 - a) independent: % concentration of dye
 - b) dependent: distance traveled in mm in the cubes
2. Analyze the relationship between the concentration of dye and the average distance traveled in the cubes.
 - as the concentration of dye increases the distance traveled by the dye into the cube increases
3. Deduce the average distance the dye traveled when the dye concentration was 10%.
 - 7 mm
4. Suggest two controlled variables for this experiment other than length of time in the solution.
 - type of celery
 - temperature
 - depth of coverage over sticks
 - volume of solution
5. Comment on the importance of these data to understand how materials move into and out of cells.
 - the greater the concentration of material inside or outside of the cell the faster it will diffuse (increases in concentration differences increase rates of diffusion)
 - might be difficult to ascertain as molecule size is not know
 - other reasonable statements that link the observations from the data to movement across a cell membrane

Question Paper on Cells

Part B: Extended Response

Choose one of the following questions and answer all parts of the question. In addition to the points awarded for each section of the question there are an additional two points available for the clarity and organization of your answer.

1. a) Compare prokaryotic and eukaryotic cells. (4 marks)
b) Outline how a specific named substance enters or exits the cell. (4 marks)
a) marks are only awarded for true comparisons

Characteristics	Prokaryote	Eukaryote
Genetic material	Chromosome in cytoplasm	Bound by a nuclear membrane
Ribosomes	Present	Present
Cell wall	Usually present	Present only in plants and fungus
Cell membrane	Present	Present
Membrane Bound organelles	Absent	Present
Cell size	Small	Large
Any example of a membrane bound organelle	Absent	Present

Any example of a membrane bound organelleb) 1 mark for example

- entry by diffusion; concentrations gradient; may mention role of protein channels; may mention size matters; may mention effects of polarity on diffusion
- exocytosis or endocytosis; role of vesicles or vacuole; active transport; large molecules; polarity;
- active transport; role of protein pumps/channels; need for cellular energy; against concentration gradient; size of molecules

2. a) State two organelles found in eukaryotes and describe their importance to the cell. (4 marks)

- two organelles named
- functions described with their importance to cell clearly stated e.g mitochondrion - converts energy from carbohydrates to usable energy in cell so cell can carry out life processes

Question Paper on Cells

b) Outline how cells divide. (4 marks)

- cell copies genetic material
- genetic material and its copy organizes itself into chromosomes (strands are attached to each other so that the two copies are traveling together)
- chromosomes move to middle of cell
- copies of chromosomes separate and one moves to each end of the cell
- genetic material is separated so that each end of cell has complete set.
- cell cytoplasm is split into two cells

3. a) State the names of the two organelles involved in energy transformations in eukaryotic cells. (2 marks)

- mitochondrion(a)
- chloroplast

b) Outline the raw materials (substrates) for each of these organelles and their products. (4 marks)

Organelle	Substrates/Reactants	Products
mitochondrion(a)	Glucose/sugar + oxygen	CO ₂ + H ₂ O
chloroplast	CO ₂ + H ₂ O	Glucose/sugar + oxygen

c) Draw a diagram of one of these two organelles. (2 marks).

- Mitochondrion shows membranes, outer and inner
- Shows folds of inner membrane/cristae
- Chloroplasts shows inner and outer membrane
- Shows stacks of inner membrane/grana/thylakoid

One mark may be awarded for clarity of the answer (Student has answered all parts of the question and the answer is easily understood.)

One mark may be awarded if in at least two parts of the answer the student has organized their answer in a sequence so that one idea flows into the next.

This activity is suitable for an independent assignment, Think-Pair-Share, or group task. Students will have a chance to practice database questions, reading contexts, attending to the command terms of the questions, and constructing extended response answers.

Subject:
Biology

DP Component & Criteria:

Question Paper on Cells

Data-Based Questions/Paper 2

Component type:
Internal

MYP Criteria:
Group 4 / Sciences